

# JIUYI ZHU

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## Education

- Ph.D. in Mathematics, June 2013  
Wayne State University, Detroit, USA
- Master of Arts in Mathematical Statistics, September 2012  
Wayne State University, Detroit, USA
- Master of Science in Applied Mathematics, June 2008  
Hunan Normal University, Changsha, China
- Bachelor of Science in Applied Mathematics, June 2005  
Hunan University, Changsha, China

## Work Experience

- Associate Professor, Louisiana State University, August 2022–Present
- Assistant Professor, Louisiana State University, July 2016–August 2022
- J.J. Sylvester Assistant Professor, Johns Hopkins University, July 2013–June 2016

## Research Interests

- Partial Differential Equations and Their Applications
- Harmonic Analysis
- Spectral Theory
- Geometric Analysis

## Grants

- 2022–2025 NSF DMS-2154506, \$207,931
- 2018–2022 NSF OIA-1832961, \$166,612
- 2018 Council on Research Summer Stipend Program, LSU, \$5,000

- 2015–2018 (Extended to 2019) NSF DMS-1656845 (formerly DMS-1500468), \$128,916
- 2014–2016 AMS-Simons Travel Grant \$4,000

## Publications

1. *Spectral inequality for Schrödinger equations with power growth potentials*, To appear in **Indiana University Mathematics Journal**, arXiv:2301.12338 (with J. Zhuge).
2. *Upper bounds of critical sets of elliptic equations on the plane*, **Vietnam Journal of Mathematics**, 51(2023), 799-810. (Invited paper dedicated to Professor Carlos E. Kenig on the Occasion of His 70th Birthday)
3. *Boundary Doubling Inequality and Nodal sets of Robin and Neumann eigenfunctions*, **Potential Analysis**, 59(2023), 375-407.
4. *Doubling inequalities and nodal sets in periodic elliptic homogenization*, **Communications in Partial Differential Equations**, 47 (2022), no. 3, 549-584 (with C. Kenig and J. Zhuge).
5. *Upper bounds of nodal sets for eigenfunctions of eigenvalue problems*, **Mathematische Annalen**, 382 (2022), 1957-1984 (with F-H. Lin).
6. *Doubling inequalities and upper bounds of critical sets of Dirichlet eigenfunctions*, **Journal of Functional Analysis**, 281(2021), no. 8, 109155.
7. *Propagation of smallness in elliptic periodic homogenization*, **SIAM Journal on Mathematical Analysis**, 53(2021), no. 1, 111-132 (with C. Kenig).
8. *Geometry and interior nodal sets of Steklov eigenfunctions*, **Calculus of Variations and Partial Differential Equations**, 59(2020), no. 5, 150.
9. *Quantitative uniqueness for second order elliptic equations with singular lower order terms*, **Communications in Partial differential equations**, 44(2019), no.11, 1217-1251 (with B. Davey).
10. *Doubling inequality and nodal sets for solutions of bi-Laplace equations*, **Archive for Rational Mechanics and Analysis**, 232(2019), no.3, 1543-1595.
11. *Fractional equations with indefinite nonlinearities*, **Discrete Continuous Dynamical Systems-A**, 39(2019), no.3, 1257-1268 (with W. Chen and C. Li).
12. *Quantitative uniqueness of solutions to parabolic equations*, **Journal of Functional analysis**, 275(2018), no.9, 2373-2403.
13. *Quantitative uniqueness of solutions to second order elliptic equations with singular lower order potentials in two dimensions*, **Calculus of Variations and Partial Differential Equations**, 57(2018), no.3, 27pp (with B. Davey).
14. *Quantitative unique continuation of solutions to higher order elliptic equations with singular coefficients*, **Calculus of Variations and Partial Differential Equations**, 57(2018), no.2, 35pp.
15. *Lower bounds for interior nodal sets of Steklov eigenfunctions*, **Proceedings of the American Mathematical Society** 144(2016), 4715-4722 (with Chris Sogge and X. Wang).

16. *Interior nodal sets of Steklov eigenfunctions on surfaces*, **Analysis & PDE**, 9(2016), no. 4, 859-880.
17. *Quantitative uniqueness of elliptic equations*, **American Journal of Mathematics** 138(2016), 733-762.
18. *Indefinite fractional elliptic problems and Liouville theorems*, **Journal of Differential Equations**, 260(2016), 4758-4785 (with W. Chen).
19. *A lower bound for nodal sets of Steklov eigenfunctions*, **Mathematical Research Letter** 22(2015), 1243-1253 (with X. Wang).
20. *Doubling property and vanishing order of Steklov eigenfunctions*, **Communications in Partial differential equations** 40(2015), no. 8, 1498-1520.
21. *Maximum principles and symmetry results of viscosity solutions for fully nonlinear equations*, **Journal of Differential Equations** 258(2015), 2054-2079 (with G. Lu).
22. *The improved Moser-Trudinger inequality with  $L^p$  norm in  $n$  dimensions*, **Advanced Nonlinear Studies** 14(2014), no. 2, 273-293.
23. *Liouville-type theorems for fully nonlinear elliptic equations in half spaces*, **Advanced Nonlinear Studies** 13(2013), 979-1001 (G. Lu).
24. *Liouville-type theorems and decay estimates for solutions to higher order elliptic equations*, **Annales de l'Institut Henri Poincaré(C) Analyse Non Linéaire** 29(2012), no. 5, 653-665 (with G. Lu and P. Wang).
25. *Hardy-Littlewood-Sobolev and Stein-Weiss inequalities and integral systems on the Heisenberg group*, **Nonlinear Analysis: Theory, Methods & Applications** 75(2012), no. 11, 4296-4314 (with X. Han and G. Lu).
26. *Characterization of balls in terms of Bessel-potential integral equation*, **Journal of Differential Equations** 252(2012), no. 2, 1589-1602 (with X. Han and G. Lu).
27. *An overdetermined problem in Riesz-potential and fractional Laplacian*, **Nonlinear Analysis: Theory, Methods & Applications** 75(2012), no. 6, 3036-3048 (with G. Lu).
28. *The axial symmetry and regularity of solutions to an integral equation in a half space*, **Pacific Journal of Mathematics** 253(2011), no. 2, 455-473 (with G. Lu).
29. *A priori estimates, existence and nonexistence of positive solutions of generalized mean curvature equations*, **Nonlinear Analysis: Theory, Methods & Applications** 74(2011), no. 18, 7126-7136 (with Q. Dai and Y. Gu).
30. *Symmetry and regularity of extremals of an integral equation related to the Hardy-Sobolev inequality*, **Calculus of Variations and Partial Differential Equations** 42(2011), no. 3-4, 563-577 (with G. Lu).
31. *Radial symmetry and regularity of solution for poly-harmonic Dirichlet problems*, **Journal of Mathematical Analysis and Applications** 377(2011), no. 2, 744-753 (with W. Chen).

## Preprints

32. *Observability inequalities for heat equations with potentials*, arXiv:2409.09476, (with J. Zhuge)
33. *Nodal sets of Dirichlet eigenfunctions in quasiconvex Lipschitz domains*, arXiv:2303.02046, (with J. Zhuge).
34. *Spectral inequalities for Schrödinger equations with various potentials* , arXiv:2403.08975,
35. *Spectral inequalities for Schrödinger equations and quantitative propagation of smallness in the plane*, (with E. Malinnikova), Preprint
36. *Boundary quantitative unique continuation for solutions of elliptic equations*, arXiv:2409.15198, (with J. Dalberg).

## Awards and Honors

- 2016, Professor Joel Dean Award for Excellence in the Teaching of Mathematics, Johns Hopkins University
- 2013, Max Coral Award for outstanding achievement in the Ph.D. Program, Wayne State University
- 2012, Outstanding Graduate Research Award, Wayne State University
- 2012, Maurice J. Zelonka Endowed Mathematics Scholarship, Wayne State University
- 2011, Maurice J. Zelonka Endowed Mathematics Scholarship, Wayne State University
- 2010–2013, Graduate Student Professional Travel Awards, Wayne State University

## Professional Service

- Co-organizer, AMS 2023 Fall Southeastern Sectional Meeting, special session “Topics in harmonic analysis and partial differential equations”, University of South Alabama, October 13-15, 2023
- Co-organizer, 3rd Annual Meeting of the SIAM Texas-Louisiana Section, mini-symposium “Topics in qualitative and quantitative properties of partial differential equations” by Zoom, Texas A&M University, October 17-18, 2020
- Co-organizer, AMS 2018 Fall Central Sectional Meeting, special session “Recent Trends on Local, Nonlocal and Fractional Partial Differential Equations”, University of Michigan, October 20-21, 2018
- Co-organizer, AMS 2018 Spring Eastern Sectional Meeting, special session “Topics in qualitative properties of partial differential equations”, Northeastern University, April 21-22, 2018
- Co-organizer, Joint Mathematics Meeting 2018, special session “Mathematical Analysis and Nonlinear Partial Differential Equations”, San Diego, January 10-13, 2018

- Co-organizer, AMS 2017 Spring Eastern Sectional Meeting, Special Session “Qualitative and quantitative properties of solutions to partial differential equations”, Hunter college, May 6-7, 2017
- Co-organizer, AMS 2015 Spring Northeastern Sectional Meeting, Special Session “Qualitative behavior of solutions of partial differential equations”, Georgetown University, March 7-8, 2015
- Analysis and PDE seminar Organizer, Johns Hopkins University, 2013-2014
- Applied analysis seminar Coorganizer, Louisiana State University, 2017-Present
- NSF panelist (2017), NSERC reviewer (2020)
- Editorial Boards: Advanced Nonlinear Studies (2021-present), Guest editor of Journal of Geometric analysis (2024-2025)
- Refereed articles for *Advances in Mathematics*, *American Journal of Mathematics*, *Analysis & PDEs*, *Archive for Rational Mechanics and Analysis*, *Calculus of Variations and Partial Differential Equations*, *Mathematische Annalen*, *Journal of Differential Equations*, *Journal of Functional Analysis*, etc
- Reviewer of Mathematical Reviews
- Undergraduate Students mentored  
Zilin Li, 2019, LSU  
Axel Rice, 2020, LSU  
Nasser Mohammed, 2021, LSU  
Chelsey Fontenot, 2022, LSU
- Member of Ph.D. Student Committees:  
Robert Sizemore, Department of Mathematics, LSU  
Jeremy T Shahan, Department of Mathematics, LSU  
Tristan M Reynoso, Department of Mathematics, LSU  
Christopher M Bunting, Department of Mathematics, LSU  
Kiran Bist Department of Mathematics, LSU  
Jack Dalberg, Department of Mathematics, LSU (Served as the advisor)  
Michaela Stone, School of Education, (Dean’s Representative), 2019, LSU  
Xiaoxiao Zhao, Department of Mechanical Engineering, (Dean’s Representative) 2019, LSU  
Mohammad Hassan, Department of Mechanical and Industrial Engineering, (Dean’s Representative), 2021 LSU  
Farid Sahebsara, Department of Mechanical and Industrial Engineering, (Dean’s Representative), 2022, LSU

## Outreach Activities

- Made mathematical demonstrations for the communities; Holy Family school at Port Allen, March 26, 2024.
- Made mathematical demonstrations for Girls Day at the Museum, February 29, 2020, LSU

- Made mathematical demonstrations for 6th Grade Day, January 16, 2020, March 7 and March 9, 2023, February 29 and March 5, 2024, LSU
- Mentored middle school students for the science fair projects at Kenilworth Science and Technology Charter School: Sarah Patterson (Female, African American) (2019)
- Served as the judge for the science fair projects at Kenilworth Science and Technology Charter School (2021, 2022, 2023), at Glasgow Middle school (2023), at LSU Discover day on Undergraduate Research (2022), at Graduate Research Conference at LSU (2024)
- Gave a talk and made mathematical demonstrations to K-12 girls (around 1,500 participants), and served as a coordinator in the math department for Girl Scout Day at LSU, 2019,
- Volunteered to help the math department on annual high school math contest hosted by LSU, Spring 2017, 2018,

## Academic Activities

### • Selected Talks

- June 16-20, 2025, Rocky Mountain Mathematics Consortium Summer School, University of Wyoming
- October 26-27 2024, Fall Western Sectional Meeting, University of California, Riverside
- October 22 2024, Analysis and PDEs seminar, Stanford University
- March, 29, 2024, Applied Math seminar, University of Alabama
- August 9-11, 2023, 10th East Asian Conference in Harmonic Analysis and Applications, Zoom
- June 29, 2023, Differential equation seminar, Hunan Normal University, China
- June 29-July 1, 2023, Workshop on Steklov eigenvalue problems, Central South University, China
- January 4-7, 2023, Two talks in different special sessions in AMS Joint Mathematics Meetings, Boston
- November 16, 2022, Analysis and Probability Seminar, Iowa State University, Zoom
- November 4-6, 2022, 5th Annual Meeting of the SIAM Texas-Louisiana Section, University of Houston
- October 18 2022, PDE and Analysis Seminar, University of Kentucky, Zoom
- October 7-9, 2022, ZhengTong Chern-Weil symposium, University of Chicago
- March 26-27, 2022, AMS Sectional Meeting, Purdue University, Zoom
- March 1, 2022, Colloquium, Georgetown University
- February 11, 2022, PDEs seminar, Houston University
- January 24, 2022, PDEs seminar, Academy of Mathematics and Systems Science, Chinese academy of sciences, China, Zoom
- January 11, 2022, Colloquium, Arizona State University
- December 15, 2021, PDEs seminar, Hubei Minzu University, China, Zoom

- November 30, 2021, Differential equation seminar, Hunan Normal University, China, Zoom
- July 3, 2021, Webinar on APDE, Zoom
- March 25, 2021, PDEs seminar, University of Tennessee, Knoxville, Zoom
- March 20-21, 2021, AMS 2021 Spring Eastern Sectional Meeting, Brown University, Zoom
- October 19, 2020, Geometric and functional inequalities and applications, Zoom
- Feb 3, 2020, Calderón-Zygmund Analysis Seminar, University of Chicago
- September 14-15, 2019, AMS 2019 Fall Central Sectional Meeting, University of Wisconsin in Madison
- April 19, 2019, Colloquium, University of Wisconsin-Milwaukee
- February 27, 2019, Analysis seminar, Baylor University
- October 22, 2018, Colloquium, Wayne State University
- October 20-21, 2018, AMS 2018 Fall Central Sectional Meeting, University of Michigan
- October 15, 2018, Applied analysis seminar, Louisiana State University
- October 5-7, 2018, Minisymposia on nonlinear partial differential equations and applications, SIAM Texas-Louisiana Section
- September 26, 2018, Harmonic analysis seminar, Louisiana State University
- July 5, 2018, Research Program working seminars on nodal sets of eigenfunctions, PCMI
- April 23, AMS 2018 Spring Eastern Sectional Meeting, Northeastern university
- April 20, 2018, PDEs seminar, Brown University
- January 25, 2018, Colloquium, University of Louisiana at Lafayette
- December 8, 2017, Analysis seminar, University of Connecticut
- November 10, 2017, Analysis seminar, Université Laval
- November 4-5, 2017, AMS 2017 Fall Western Sectional Meeting, University of California, Riverside
- November 3, 2017, Colloquium, California State University, Northridge
- May 6-7, 2017, AMS 2017 Spring Eastern Sectional Meeting, Hunter College
- March 24, 2017, Colloquium, Southern Mississippi University
- January 09-13, 2017, Young Geometric Analysts' Forum 2017, TSIMF, Sanya, China
- January 06, 2017, PDEs seminar, Beijing Normal University, China
- January 04, 2017, Analysis and PDEs seminar, Chinese Academy of Sciences, China
- November 16, 2016, Harmonic analysis and applied analysis seminar, Louisiana State University
- April 13, 2016, Colloquium, Yeshiva University
- April 08, 2016, Montreal Analysis Seminar, McGill University
- March 14, 2016, Colloquium, California State University, Northridge
- February 24, 2016, Colloquium, Florida International University
- February 19-21, 2016, 15th New Mexico Analysis Seminar, University of New Mexico
- February 11 2016, Colloquium, Louisiana State University

- January 27, 2016, Colloquium, University of Texas at San Antonio
- January 6-9, 2016, 2016 Joint Mathematics Meetings, Seattle, WA
- December 7-10, 2015, SIAM Conference on the Analysis of Partial Differential Equations, Scottsdale, Arizona
- October 22, 2015, Geometry and Topology seminar, Binghamton University
- June 02, 2015, Analysis and PDEs seminar, Chinese Academy of Sciences, China
- May 30-31, 2015, Workshop on Hamiltonian Systems and Variational Methods, Southeast University, China
- May 27, 2015, Analysis and PDEs seminar, Yau mathematical Sciences Center, Tsinghua University, China
- May 26, 2015, Analysis and PDEs seminar, Renmin University of China, China
- May 22-25, 2015, International Conference on Harmonic Analysis and Applications, Central China Normal University, China
- March 14-15, 2015, AMS Central Spring Sectional Meeting, Michigan State University
- March 7-8, 2015, AMS Spring Northeastern Sectional Meeting, Georgetown University
- February 02, 2015, Analysis and PDEs seminar, Johns Hopkins University
- November 21, 2014, Geometry and Geometric analysis seminar, Princeton University
- May 12-16, 2014, Kinetics, non-standard diffusions and stochastics: emerging challenges in the sciences, University of Texas at Austin
- March 28, 2014, Colloquium, The College of William & Mary
- March 13-15, 2014, International Workshop “Advances in Nonlinear Analysis”, University of Pittsburgh
- March 8-9, 2014, The 4th Ohio River Analysis Meeting, University of Kentucky
- November 25, 2013, Differential Equations seminar, University of Maryland–Baltimore County
- October 30 and November 6, 2013, Hopkins Analysis Workshop, Johns Hopkins University
- February 13, 2013, PDEs seminar, Wayne State University
- January 11, 2013, 2013 Joint Mathematics Meetings, San Diego, CA
- September 24-28, 2012, Dynamical Systems in Studies of Partial Differential Equations, Institute for Mathematics and its Applications
- May 20-23, 2012, The 5th Symposium on Analysis and PDEs, Purdue University
- March 6, 2012, The 3rd Annual Graduate Exhibition, Wayne State University
- October 5 and October 12, 2011, PDEs seminar, Wayne State University
- May 12-14, 2011, International Conference: Recent Development on  $L^\infty$ -Variational Problems and Associated Nonlinear Partial Differential Equations, University of Kentucky
- March 19-20, 2011, 67th Midwest Partial Differential Equations seminar, University of Illinois at Urbana-Champaign
- January 19 and January 26, 2011, PDEs seminar, Wayne State University

● **Conferences and Workshops Attended**



- April 12-14, 2019, Rivière-Fabes symposium on Analysis and PDE, University of Minnesota
- July 1-14, 2018, PCMI Summer Session 2018 on Harmonic analysis
- April 28-30, 2017, Rivière-Fabes symposium on Analysis and PDE, University of Minnesota
- May 23-27, 2016, Calculus of Variations and Nonlinear Partial Differential Equations, Columbia University
- May 21-23, 2016 Analysis and Beyond: Celebrating Jean Bourgain's Work and Impact, IAS
- May 16-20, 2016, Conference in Harmonic Analysis in Honor of Michael Christ, University of Wisconsin-Madison
- November 2-4, 2015, Fifth Abel Conference: Celebrating the Mathematical Impact of John F. Nash Jr. and Louis Nirenberg, Institute for Mathematics and its Applications
- April 17-19, 2015, The Eighteenth Rivière-Fabes symposium on Analysis and PDE, University of Minnesota
- June 9-20, 2014, Thematic Program on Nonlinear PDEs in Geometry and Physics, University of Notre Dame
- May 7-18, 2012, Concentration month on Nonlinear Elliptic PDEs, University of Chicago
- April 20-22, 2012, The Fifteenth Rivière-Fabes symposium on Analysis and PDE, University of Minnesota
- November 4-6, 2011, 68th Midwest Partial Differential Equations Seminar, University of Notre-Dame
- January 29-30, 2011, Ohio River Analysis Meeting, University of Cincinnati
- July 12–August 6, 2010, The Summer School in Partial Differential Equations, East China Normal University, China
- July 6-9, 2010, The Seventh East China Partial Differential Equations Conference, Central China Normal University, China
- November 14-15, 2009, Workshop on Fourier and Harmonic Analysis, Wayne State University

- **Visits**

- University of Chicago, February–April, 2019 and January–March, 2020
- Stanford University, October, 2024

## Teaching

- August 2016–Present, Department of Mathematics, Louisiana State University
  - *Introduction to Partial Differential Equations*, Graduate course (Fall 2022)
  - *Topics on Elliptic Partial Differential Equations*, Graduate course (Spring 2022, Spring 2024)
  - *Multidimensional Calculus*, Two sections (Fall 2021), (Fall 2023)
  - *Elementary Differential Equations*, (Spring 2023)

- *Differential and integral Calculus I*, (Spring 2021)
  - *Complex analysis*, Graduate course (Fall 2020)
  - *Mathematical Methods in Engineering*, Two sections (Fall 2019),
  - *Topics in Spectral Geometry and PDEs*, Graduate course (Fall 2018)
  - *Partial Differential Equations*, (Fall 2018), (Fall 2023)
  - *Analytic Geometry and Calculus II*, Two sections (Spring 2018)
  - *Theory of Partial Differential Equations*, Graduate course (Fall 2017)
  - *Multidimensional Calculus*, Two sections (Fall 2016)
- September 2013–June 2016, Department of Mathematics, Johns Hopkins University
    - *Calculus I*, Lecture course with 2 sections (Spring 2016)
    - *Calculus III*, Lecture course with 11 sections (345 students) (Fall 2015)
    - *Differential Equations with Applications*, Lecture course with 7 sections (147 students) (Spring 2015)
    - *Fourier Analysis* (Fall 2013 and Fall 2014)
    - *Honors Analysis II* (Spring 2014)
    - *Partial Differential Equations for Applications* (Spring 2014)
- September 2008–August 2013, Graduate Teaching Assistant, Department of Mathematics, Wayne State University
    - Served as the sole instructor with full responsibility (including lectures, student consultation, designing and grading quizzes and tests) in the following classes:
      - *Probability and Statistics for Teachers* (Spring/Summer 2012)
      - *Probability and Statistics* (Spring/Summer 2012)
      - *Calculus I* (Spring/Summer 2011)
      - *Pre-calculus* (Fall 2011 and Winter 2012)
      - *College Algebra for the Social and Management Sciences* (Spring/Summer 2011)
      - *Algebra with Trigonometry* (Winter 2009, Fall 2009, Winter 2010, and Winter 2011)
      - *Beginning Algebra* (Fall 2010)